

CLAIMS

We claim:

1. A liquid composition for coating surfaces comprising about 0.01 % by weight to about 2 % by weight of a near infrared absorbing agent, about 20 % by weight to about 60 % by weight of a carrier vehicle; and about 40 % by weight to about 80 % by weight of a solvent system, based on the total weight of the composition.

2. The liquid composition of claim 1 comprising about 0.1 % to about 2 % by weight of the near infrared absorbing agent, about 30 % by weight to about 45 % by weight of the carrier vehicle, and about 55 % by weight to about 70 % by weight of the solvent system, each based upon the total weight of the composition.

3. The liquid composition for coating surfaces of claim 1 further comprising an one or more organofunctional silane additive(s) selected from the group consisting of aminofunctional silanes, epoxyfunctional silanes and vinylfunctional silanes.

4. The liquid composition for coating surfaces of claim 3, wherein the one or more organofunctional silane additive(s) are present in the amount of about 0.01 % to about 2 % by weight of the liquid composition.

5. The liquid composition for coating surfaces of claim 1, wherein the near infrared absorbing agent is selected from the group consisting of compounds of the formula (I):



wherein R is an alkyl group of about 1 to about 6 carbon atoms; Z is an unsubstituted divalent phenyl or a divalent phenyl substituted with at least one moiety selected from the group consisting of alkyl, alkoxy, halogen, nitro, cyano, and carboalkoxy groups; Z' is an unsubstituted quinoidal phenyl or a quinoidal phenyl substituted with at least one moiety selected from the group consisting of alkyl, alkoxy, halogen, nitro, cyano, and carboalkoxy groups; and X is an anion of a strong acid, and compounds of the formula (II):



wherein R is an alkyl group of about 1 to about 6 carbon atoms; Z is an unsubstituted divalent phenyl or a divalent phenyl substituted with at least one moiety selected from the group

consisting of alkyl, alkoxy, halogen, nitro, cyano, and carboalkoxy groups; and X is an anion of a strong acid.

6. The liquid composition for coating surfaces of claim 1, wherein the carrier vehicle is at least one polymer selected from homopolymers and copolymers of the group consisting of cellulose, polyacrylics, polyurethanes, polyesters, polyvinyls, polyamides, polyolefins, and derivatives and mixtures thereof.

7. The liquid composition for coating surfaces of claim 6, wherein the carrier vehicle comprises an acrylic copolymer.

8. The liquid composition for coating surfaces of claim 7, wherein the carrier vehicle further comprises a polyurethane.

9. The liquid composition for coating surfaces of claim 1, wherein the carrier vehicle comprises a water-borne carboxyl and hydroxyl functional acrylic copolymer.

10. The liquid composition for coating surfaces of claim 9, wherein the water-borne carboxyl and hydroxyl functional acrylic copolymer has an acid number of about 10 to about 50, a hydroxyl number of about 20 to about 50, and a molecular weight of about 20,000 to about 40,000.

11. The liquid composition for coating surfaces of claim 1, wherein the carrier vehicle comprises a copolymer formed by polymerization of monomers comprising:

- (a) about 45 % to about 55 % by weight butyl acrylate,
- (b) about 38 % to about 45 % by weight methylmethacrylate,
- (c) about 4 % to about 10 % by weight hydroxyethylmethacrylate,
- (d) about 0 % to about 8 % by weight methacrylic acid, and
- (e) about 0 % to about 2 % by weight acrylic acid.

12. The liquid composition for coating surfaces of claim 1, wherein the carrier vehicle comprises a copolymer formed by the polymerization of monomers comprising:

- (a) about 40 % to about 70 % by weight methylmethacrylate,
- (b) about 10 % to about 30 % by weight ethylacrylate,

(c) about 20 % to about 30 % by weight

dimethylaminoethylmetacrylate.

13. The liquid composition for coating surfaces of claim 1, wherein the solvent system comprises a ketone.

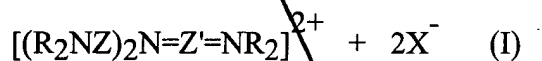
14. The liquid composition for coating surfaces of claim 13, wherein the ketone is selected from the group consisting of acetone, and methylethylketone.

15. The liquid composition for coating surfaces of claim 13, wherein the solvent system further comprises at least one component selected from the group consisting of alcohols, terpenes, and glycol ethers.

16. The liquid composition for coating surfaces of claim 1, further comprising one or more additives selected from the group consisting of ultraviolet absorbers, flatting agents, slip agents, and pH modifiers.

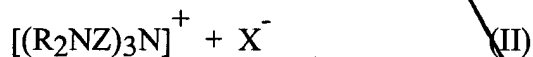
17. A liquid composition for coating surfaces comprising;

(a) a near infrared absorbing agent selected from the group consisting of compounds of the formula (I):



wherein R is an alkyl group of about 1 to about 6 carbon atoms; Z is a divalent phenyl which may or may not be ring substituted with one or more alkyl, alkoxy, halogen, nitro, cyano, and carboalkoxy groups; Z' is a quinoidal phenyl which may or may not be ring substituted with one or more alkyl, alkoxy, halogen, nitro, cyano, and carboalkoxy groups; and X is an anion of a strong acid, and

compounds of the formula (II):



wherein R is an alkyl group of about 1 to about 6 carbon atoms; Z is a divalent phenyl which may or may not be ring substituted with one or more alkyl, alkoxy, halogen, nitro, cyano, and carboalkoxy groups; and X is an anion of a strong acid;

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polymerization of:

(b) a carrier vehicle comprising a copolymer formed by

- (i) about 45 % to about 55 % by weight butyl acrylate,
- (ii) about 38 % to about 45 % by weight methylmethacrylate,
- (iii) about 4 % to about 10 % by weight

hydroxyethylmethacrylate,

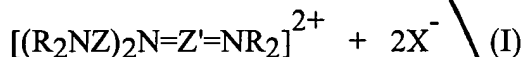
- (iv) about 0 % to about 8 % by weight methacrylic acid, and
- (v) about 0 % to about 2 % by weight acrylic acid; and

(c) a solvent system.

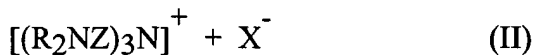
18. The liquid composition for coating surfaces of claim 17, wherein the near infrared absorbing agent is present in an amount of about 0.01 % to about 2 % by weight of the composition; the carrier vehicle is present in an amount of about 20 % to about 60 % by weight of the composition; and the solvent system is present in an amount of about 40 % to about 80 % by weight of the composition.

19. A liquid composition for coating surfaces comprising,

(a) a near infrared absorbing agent selected from the group consisting of compounds of the formula (I):



wherein R is an alkyl group of about 1 to about 6 carbon atoms; Z is a divalent phenyl which may or may not be ring substituted with one or more alkyl, alkoxy, halogen, nitro, cyano, and carboalkoxy groups; Z' is a quinoidal phenyl which may or may not be ring substituted with one or more alkyl, alkoxy, halogen, nitro, cyano, and carboalkoxy groups; and X is an anion of a strong acid, and compounds of the formula (II):



wherein R is an alkyl group of about 1 to about 6 carbon atoms; Z is a divalent phenyl which may or may not be ring substituted with one or more alkyl, alkoxy, halogen, nitro, cyano, and carboalkoxy groups; and X is an anion of a strong acid;

(b) a carrier vehicle comprising a copolymer formed by

polymerization of:

- (i) about 40 % to about 70 % by weight methylmethacrylate,
- (ii) about 10 % to about 30 % by weight ethylacrylate,
- (iii) about 20 % to about 30 % by weight

dimethylaminoethylmetacrylate, and

(c) a solvent system.

20. A method of reducing the reflection of near infrared radiation from a surface, comprising:

(a) applying to the surface, a liquid composition comprising:

- (i) a near infrared absorbing agent;
- (ii) a carrier vehicle; and
- (ii) a solvent system; and

(b) removing the solvent system, whereby a near-infrared absorbent coating is provided on the surface.

21. The method of claim 20, wherein the solvent system is removed by evaporation.

22. The method of claim 20, wherein the coating has a thickness of about 0.25 mil to about 2 mil.

23. The method of claim 20, wherein the coating is capable of absorbing greater than about 99 % of radiation with wavelength of about 885-920 nm incident upon the coating.

24. The method of claim 20, wherein the near infrared absorbing agent is selected from the group consisting of compounds of the formula (I):



wherein R is an alkyl group of about 1 to about 6 carbon atoms; Z is a divalent phenyl which may or may not be ring substituted with one or more alkyl, alkoxy, halogen, nitro, cyano, and

carboalkoxy groups; Z' is a quinoidal phenyl which may or may not be ring substituted with one or more alkyl, alkoxy, halogen, nitro, cyano, and carboalkoxy groups; and X is an anion of a strong acid, and compounds of the formula (II):



wherein R is an alkyl group of about 1 to about 6 carbon atoms; Z is a divalent phenyl which may or may not be ring substituted with one or more alkyl, alkoxy, halogen, nitro, cyano, and carboalkoxy groups; and X is an anion of a strong acid.

10 25. A surface having a coating with a thickness of about 0.25 mil to about 2 mil, comprising:

- (a) a near infrared absorbing agent; and
- (b) a carrier vehicle,

wherein the thickness is measured in a direction transverse to the surface.

15 26. A copolymer useful as a carrier vehicle, said copolymer prepared by polymerizing:

- (a) about 45 % to about 55 % by weight butyl acrylate,
- (b) about 38 % to about 45 % by weight methylmethacrylate,
- (c) about 4 % to about 10 % by weight hydroxyethylmethacrylate,
- (d) about 0 % to about 8 % by weight methacrylic acid, and
- (e) about 0 % to about 2 % by weight acrylic acid.

20 27. A copolymer useful as a carrier vehicle, said copolymer prepared by polymerizing:

- (a) about 40 % to about 70 % by weight methylmethacrylate,
- (b) about 10 % to about 30 % by weight ethylacrylate,
- (c) about 20 % to about 30 % by weight

dimethylaminoethylmetacrylate.

28. A method of producing a copolymer useful as a carrier vehicle, said method comprising polymerizing:

- (a) about 45 % to about 55 % by weight butyl acrylate,
- (b) about 38 % to about 45 % by weight methylmethacrylate,
- (c) about 4 % to about 10 % by weight hydroxyethylmethacrylate,
- (d) about 0 % to about 8 % by weight methacrylic acid, and
- (e) about 0 % to about 2 % by weight acrylic acid.

29. A method of producing a copolymer useful as a carrier vehicle, said method comprising polymerizing:

- (a) about 40 % to about 70 % by weight methylmethacrylate,
- (b) about 10 % to about 30 % by weight ethylacrylate,
- (c) about 20 % to about 30 % by weight

dimethylaminoethylmetacrylate.